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FIELD ANALYTICAL TECHNICAL MEMORANDUM

Date: August 27, 2014

To: Earl Liverman, On-Scene Coordinator, EPA, Seattle, Washington

From: Chris Whitehead, START IV Chemist, E & E, Seattle, Washington

Through: Steven G. Hall, START IV Removal Team Leader, E & E, Seattle, Washington

Subject: Fourth Avenue and Gambell Parking Lot Site, Anchorage, Alaska
Vapor Intrusion Investigation Utilizing the Hapsite GC/MS

Ref: Contract Number: EP-S7-13-07
Technical Direction Document Number: 13-08-0020

1.0 Introduction

The U.S. Environmental Protection Agency (EPA), in coordination with the Alaska Department of Environmental Conservation (ADEC), is performing a removal action focused on reducing vapor intrusion of tetrachloroethylene (PCE), also known as perchloroethylene or tetrachloroethene, and its degradation products, trichloroethene (TCE), cis-1,2-dichloroethene (cDCE), and vinyl chloride (VC), from contaminated groundwater and soil through subsurface soils and into indoor air spaces of overlying single- and multi-family buildings at the 4th and Gambell Parking Lot (Site) in Anchorage, Alaska. (See the Site setting in Figure 1, Site Location Map.) ADEC has established a target screening level for indoor residential air for most chlorinated volatile organic compounds (VOCs) and the target level for PCE is 42 micrograms per cubic meter (ug/m^3).

EPA On-Scene Coordinator (OSC) Earl Liverman was on-Site during the initial screening of indoor air by field instrumentation and during the installation of engineering controls at the residences. EPA OSC Bob Whittier coordinated with ADEC on site progress and expectations during the entire project timeline.

2.0 Background

Substantial environmental information exists about the Site. Numerous environmental investigations beginning in the mid-1990s show that soil, soil gas, and groundwater at the Site are contaminated by PCE and its degradation products and that these VOCs may pose a chronic human health risk through inhalation of indoor air

ADEC requested EPA's assistance with mitigating the migration of PCE and other chlorinated VOC vapors from the subsurface into overlying buildings at the Site. EPA approved a time-critical removal action in January 2014 to be performed at the Site.[1]

The removal action consists of installation of passive systems, referred to generally as engineering controls, intended to reduce the migration of contaminated subsurface vapors to indoor air spaces. The installation of these engineering controls was performed by Ahtna Engineering Services, LLC (Ahtna), a subcontractor to the EPA Region 10 Emergency and Rapid Response Services (ERRS) contractor Environmental Quality Management, Inc.

Passive vapor intrusion mitigation systems were installed at each of the four properties. The specific installation in each building varied based on the structure. However, the basic principal of mitigation in each building was the same. Vapor barriers, either coatings or liners, were used to seal the building from the subsurface. Extraction lines and wells were then installed to provide a preferential pathway for accumulated vapors below the vapor barrier to be vented through vertical exhaust stacks routed on the exterior of each building. Construction and installation specifics for the mitigation system components are further detailed in the final design plan.[2]

The focus of this memorandum is the presentation of field screening results collected by Ecology and Environment, Inc. (E & E) in support of the removal action. The removal action was not intended to address the subsurface source of the contaminant vapors (i.e., contaminated soil or groundwater).

3.0 Field Screening

EPA tasked E & E to provide removal action support under Superfund Technical Assessment and Response Team (START)-IV contract number EP-S7-13-07, Technical Direction Document (TDD) number 13-08-0020. Specifically, EPA tasked START to perform field screening of the residences for PCE and its degradation products during and after the installation of the engineering controls. Note, this memorandum only reports results for PCE, at the request of the EPA; however, results for degradation products discussed above were also acquired. In addition to the field screening performed by START, summa canister sampling was performed by Ahtna at certain screening locations approximately two weeks after installation of the engineering controls was completed to determine the effectiveness of the passive systems. Field screening for VI is intended to produce reliable and actionable information while on-Site for decision-making purposes such as sample locating or preliminary site characterization. Summa canister sampling is performed for confirmation of field screening results and, in the event of discrepancies between the two data sources, is considered more reliable unless a source of error is identified. Both types of field data were collected for the purposes of decision-making and confirmation.

Four separate structures are present at the Site. The four residences are occupied during at least some part of the calendar year. Two of the structures at 736 East 3rd Avenue are duplexes containing two residential units in each, and these are occupied on a regular basis. The two residences are distinguished as the north duplex (736 East 3rd Avenue – North) and the south duplex (736 East 3rd Avenue – South). The residence at 736 East 3rd Avenue - South contains only a crawlspace while 736 East 3rd Avenue - North contains a sub-floor basement. The other

[1] Earl Liverman, 17 January 2014. *Action Memorandum for Subarea II of the Fourth and Gambell Street Site, Anchorage, Municipality of Anchorage Borough, Alaska.*

[2] Ahtna Engineering, 12 May 2014. *Vapor Intrusion Mitigation Systems Design Plan – Final 4th and Gambell, Anchorage, AK*. Prepared for Environmental Quality Management, Inc. (EQM), Bothell, WA.

two residences are single-family homes, with 710 East 3rd Avenue occupied on an occasional basis and 720 East 3rd Avenue occupied on a regular basis. The first floor of the 720 East 3rd Avenue residence includes an occupied first floor and an unoccupied sub-floor basement finished with several rooms used primarily for storage or utility operations, while the 710 East 3rd Avenue has an unoccupied first floor and a finished subfloor basement that is unoccupied. A map identifying the four residences is located in Figure 2.

On May 12 through 15, 2014, two START chemists performed field screening of indoor air. The purpose of this initial field screening event was to identify baseline concentrations of PCE in indoor air due to vapor intrusion (VI) known to be present based on the results of previous investigations. Additionally, one START contractor returned on May 28 and 29, 2014 and again on June 13, 2014 to perform targeted indoor air screening at areas where VI was known to be present within the on-Site residences (i.e., subfloor crawlspaces and basements only). The field screening results were intended to assist in determining the effectiveness of the engineering controls, and some of the field screening locations were collocated with the summa canister samples discussed above.

4.0 Vapor Intrusion

VI of chlorinated organic compounds is a concern due to the potential to chronically affect human health. As previously mentioned, the VI contaminants of concern for this Site are PCE and its degradation products TCE, cDCE, and VC. These known or suspected carcinogens can contaminate groundwater and aquifers and commonly originate from industrial releases. Chlorinated solvents are currently and historically used by dry cleaners and various other industrial manufacturing processes. Since chlorinated organic compounds are denser than water, they can migrate downward when present in groundwater and are thus classified as dense non-aqueous phase liquids (DNAPL). Over time, these DNAPLs partition between liquid and gas phase and slowly migrate upward towards surface level as contaminated soil gas. Structures located over the upward migrating gas can draw the contaminated soil gas towards it due to a variety of geophysical properties. As the contaminated soil gas encounters the structure, it can concentrate in areas where soil gas migration pathways to indoor air are located. This may include locations such as utility piping or seams and cracks in foundations and can result in pathways to indoor air.

4.1 Procedures

The Field Analytical Services Team (FAST), a subgroup under E & E START, performed a VI investigation method to analyze chlorinated organics in air using a field-portable Hapsite GC/MS (gas chromatograph/ mass spectrometer). The method is intended for rapid characterization by collecting a small-volume air sample and immediately analyzing it in less than 10 minutes. The instrument selectively analyzes for several chlorinated compounds, including PCE and its degradation products, and it is accurate to parts per billion (ppb) levels. Additional information and details on the method utilized by FAST for VI investigations can be found in SOP 309a - Standard Operating Procedures for Analysis of Toxic Volatile Organics in Air by HAPSITE GC/MS.

The general procedure for VI assessment consists of several steps. First, a baseline sample of ambient air outside the structure is acquired and analyzed. Then, subsequent samples are collected from the interior of the structure, typically starting at the suspected point of lowest concentration and working towards areas where the highest concentration is suspected.

Typically, this means starting at higher floors in multi-level structures and working down to lower floors; however, for sites of known contamination, targeted sampling may be performed. Presumably, the highest concentrations occur at ground surface or subsurface spaces since they are closest to the soil gas migration pathways. For subsurface crawlspaces or other spaces that are inaccessible by sampling personnel and the instrument itself, ¼-inchTeflon tubing may be run into the space and then primed with representative air from that space before collecting the sample. Generally, a purge rate equal to two to three times the volume in the length of tubing is sufficient to ensure a representative sample.

In addition to samples collected in sample mode as described in the method SOP, the Hapsite GC/MS can also be used in a direct-read capacity surveying potential preferential pathways where direct conduits to subsurface soil is possible such as utility piping, seams and cracks in concrete flooring, and floor drains. In this survey mode, the Hapsite cannot provide quantitative results for the detections; the output is read qualitatively as a significant increase above the baseline concentration detected initially. Typically, concentrations above approximately 20 ppb are required to show any response from the instrument; however, concentrations at the preferential pathways may exceed this value even if the baseline concentrations detected in samples from the space do not.

5.0 Results

Samples of indoor air were collected and analyzed by START using the Hapsite GC/MS as described above. Sampling points were either in individual rooms, in the subfloor basements, or separated from other sampling points by at least 5 feet. In addition, sampling points in crawlspaces were sampled through ¼-inch Teflon tubing staged at sampling points within the interior of the crawlspace and purged prior to sampling.

Sample results were recorded by the Hapsite and documented by START chemists using electronic field forms. Sample results were qualified through routine data validation procedures based on the results of quality control samples analyzed in conjunction with the sampling activities.

Hapsite GC/MS sample results were validated according to the Stage 2B Data Validation Manual Process which consists of a verification and validation of the data based on completeness and compliance checks of both sample-related and instrument-related QC results. Results from May 12 and May 28 were qualified with the J-flag indicating estimated concentrations with either no known or with variable bias. Samples collected during each sampling event that were not detected above the instrument's method detection limit are qualified with a U-flag. See Attachment 1 for detailed results of data validation assessment.

5.1 Pre-mitigation sampling event – May 12 to May 14, 2014

Initial screening of the four residences on-Site was performed prior to installation of engineering controls. The initial screening provides baseline concentrations of contaminants in indoor air at the specific time of the sampling. See Table 1 for a summary of pre-mitigation sampling results. Samples exceeding the ADEC target screening level are highlighted.

Table 1 – Pre-mitigation Sampling for PCE				
Location	**Sub-Location**	**Sample ID**	**Date**	**Result**
736 3rd Ave North Duplex	Central Sample Point (at raised slab)	HS01IA03	5/12/2014	**51.32 JK**
	Laundry Room	HS01IA01		**79.63** JK
	North Sample Point (on raised slab)	HS01IA04		0.027 U
	South Sample Point (in basement area)	HS01IA02		**76.66** JK
736 3rd Ave South Duplex	South Duplex - Background	HS02BK01	5/13/2014	0.027 U
	Crawlspace North Sample Point	HS02CS02		16.55
	Crawlspace South Sample Point	HS02CS01		17.07
720 3rd Ave	Crawlspace	HS03CS01	5/13/2014	0.027 U
	Art Room	HS03IA04	5/14/2014	**121.84**
	Background	HS03BK01		0.59
	Crawlspace	HS03CS02		0.027 U
	Hallway	HS03IA05		**139.33**
	Laundry Room	HS03IA01		**140.90**
	Laundry Room (Utility Cubby)	HS03IA06		**114.50**
	North Bed Room	HS03IA03		**124.45**
	Tool Room	HS03IA02		**122.82**
710 3rd Ave	Basement	HS04IA01	5/14/2014	3.40
	Crawlspace (in Basement)	HS04CS01		3.92
	Former Office Area (in Basement)	HS04IA02		3.76
	Storage Area (under stairs)	HS04IA03		3.41

Note = All results reported in ug/m^3

U = The analyte was analyzed for, but was not detected above the reported quantitation limit

JK = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias

736 East 3rd Avenue – North Duplex
PCE results exceeded the ADEC target level for indoor residential air of 42 ug/m^3 in all samples at this location, except for one sample point at an indoor crawlspace which was less than the method detection limit.

736 East 3rd Avenue – South Duplex
PCE results did not exceed the ADEC target level but were detected above the instrument's reporting limit. Samples collected at this location were from the aboveground crawlspace acquired through Teflon tubing placed in the center of the structure approximately 20 feet north and south from the crawlspace entrance.

720 East 3rd Avenue
PCE results exceeded the ADEC target level in every indoor sample at this location. In addition to samples collected in sample mode, the Hapsite GC/MS was also used in survey mode as discussed in the Procedures Section above to identify preferential VI pathways in the subfloor basement. The survey was performed in areas including utility piping passing through the concrete foundation, seams and cracks in the foundation, and floor drains. The survey showed significant deviations from background at the utility piping and some of the cracks in the foundation floor; however, the floor drains and seam of the slab establishing the interior crawlspace did not deviate significantly from background concentrations.

710 East 3rd Avenue
PCE results were below the ADEC target level in all samples collected at this location.

5.2 Initial post-mitigation sampling event – May 28 and 29

The post-mitigation screening was performed at the four residences on-Site approximately two weeks after the installation of the engineering controls. The controls were installed with the intention of reducing the migration of contaminated VI to indoor air. START performed the Hapsite GC/MS field screening in conjunction with Summa canister sampling by GeoSyntec Consultants, a subcontractor to the ERRS subcontractor Ahtna.

The Summa canister samples were submitted by GeoSyntec Consultants to ALS Environmental for analysis according to EPA Method TO-15 for Toxic Organic Compounds in Ambient Air, and those results are included in Table 2 along with the Hapsite results. The Summa canister data was validated by a START chemist, and the results and associated data validation memorandum is included in Attachment 1. Samples exceeding the ADEC target screening level are highlighted.

736 East 3rd Avenue – North Duplex
PCE results were generally higher than the corresponding sample point collected during pre-mitigation sampling. The sample results did show the widest range of variation suggesting a potential concentration gradient present in the room, which may be caused by increased diffusion from a preferential pathway which previously had not contributed significantly or at all to contaminant loading of VI to indoor air.

736 East 3rd Avenue – South Duplex
PCE results were generally consistent with the results from the pre-mitigation sampling; no significant deviation was observed in PCE concentrations. The results were below the ADEC target level for indoor air.

720 East 3rd Avenue
PCE results were generally consistent with results obtained from the pre-mitigation sampling event; no significant deviation was observed in PCE concentrations. The results exceeded the ADEC target level for indoor air. EPA did not install the concrete sealant component (i.e., RetroCoat ™) of the VI mitigation system because of certain concerns raised by the homeowner, including movement of personal and commercial belongings from the basement and scheduling the removal work to be performed. It is not known whether the addition of the concrete sealant would have improved (i.e., lowered) the post-mitigation contaminant concentrations.

710 East 3rd Avenue
PCE results were generally consistent with results obtained from the pre-mitigation sampling event; no significant deviation was observed in PCE concentrations. The results were below the ADEC target level for indoor air.

Table 2 – Initial Post-mitigation Sampling for PCE

Location	Sub-Location	Sample ID	Date	START Hapsite Result	ERRS/Ahtna Summa Canister Result
736 3rd Ave North Duplex	Basement (Center) [1]	HS01IA05	5/29/2014	**169.39** [1]	**78 (53 duplicate)**
	Basement (North)	HS01IA06		**210.47**	NA
	Laundry Room	HS01IA07		**111.05**	NA
736 3rd Ave South Duplex	North Section	HS02CS04	5/29/2014	19.31	8.8 [2]
	South Section	HS02CS03		22.09	
720 3rd Ave	Artwork Room	HS03IA09	5/28/2014	**121.67 JK**	NA
	Background	HS03BK02		0.72 JK	NA
	Bedroom [1]	HS03IA08		**102.46 JK** [1]	**66**
	Ground Floor Master Bedroom	HS03IA12		27.12 JK	NA
	Stairwell	HS03IA11		**65.30 JK**	NA
	Stairwell	HS03IA13		**55.36 JK**	NA
	Tool Room	HS03IA07		**111.27 JK**	NA
	Utility Room	HS03IA10		**109.78 JK**	NA
710 3rd Ave	Background	HS04BK02	5/28/2014	0.59 JK	NA
	North Bedroom	HS04IA04		3.95 JK	NA
	South Hallway [1]	HS04IA06		5.08 JK [1]	3.9
	Utility Room	HS04IA05		3.30 JK	NA

Note = All results reported in ug/m^3.
[1] = Sample collocated with ERRS/Ahtna Summa canister.
[2] = Summa canister sample was not specifically collocated with a START Hapsite screening location.
NA = not applicable
JK = The analyte was positively identified; the associated numerical value reported is approximate with an unknown direction of bias.

5.3 Follow-up post-mitigation sampling event – June 13

Because the post-installation results were above ADEC target levels at two of the site residences (720 East 3rd Avenue and 736 East 3rd Avenue – North), EPA tasked START to return to the site and perform additional field screening at the two residences to confirm the findings. START was denied access to 720 3rd Avenue, so field screening during this sampling event was only performed at 736 East 3rd Avenue – North. See Table 3 for a summary of the results from the

final post-mitigation sampling event. Samples exceeding the ADEC target screening level are highlighted.

Table 3 – Final Post-mitigation Sampling for PCE

Location	Sub-Location	Sample ID	Date	Result
736 3rd Ave North Duplex	Floor Drain	HS01IA10	6/13/2014	**146.29**
	Laundry Room	HS01IA11		**128.79**
	Middle of Shop (previous Summa Point)	HS01IA08		**149.75**
	Middle of Shop (previous Summa Point)	HS01IA09		**152.28**

Note = All results reported in ug/m^3

736 East 3rd Avenue – North Duplex
A narrower range of PCE concentrations was observed in the space during this sampling event, with results generally consistent with the average concentration observed during the initial post-mitigation sampling. The narrow range suggests that the potential gradient observed during the May 28-29 sampling had reached equilibrium. Additionally, a sample was collected at the interface of a floor drain in the center of the subfloor basement which exceeded the ADEC target level; previously, during the pre-mitigation sampling, this point had been surveyed, but did not show a deviation from background concentrations.

6.0 Conclusion

Field screening of indoor air was performed at four residences as part of the 4th and Gambell Parking Lot Site removal action during May and June 2014. Screening was performed to determine concentrations of PCE before and after installation of VI mitigation systems.

The results of pre- and post-mitigation sampling indicated that PCE concentrations remained above the ADEC target level for residential indoor air at subsurface areas in two residences at the site, 720 East 3rd Avenue and 736 East 3rd Avenue – North. PCE concentrations in the other two residences, 710 East 3rd Avenue and 736 East 3rd Avenue, were below the ADEC target level during both pre- and post-mitigation sampling events.

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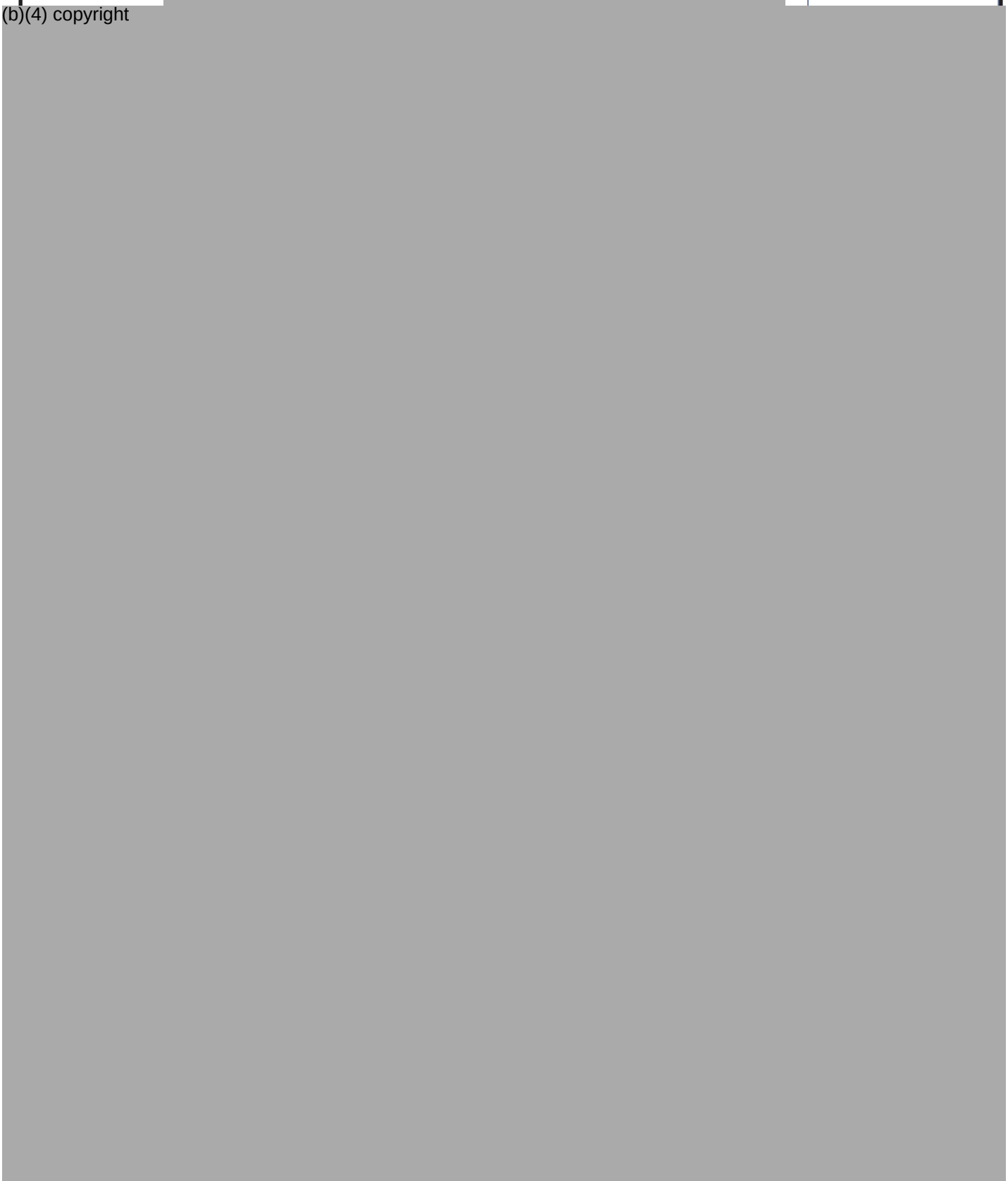

ecology and environment, inc. Global Environmental Specialists Seattle, Washington	FOURTH AVENUE AND GAMBELL PARKING LOT Anchorage, Alaska	Figure 1 SITE VICINITY MAP		
	0 .5 1 Approximate Scale in Miles	Date: 9-6-13	Drawn by: AES	10:START-3\11040001\fig 1

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ecology and environment, inc. Global Environmental Specialists Seattle, Washington	FOURTH AVENUE AND GAMBELL PARKING LOT Anchorage, Alaska	Figure 2 SITE MAP		
	0 50 100 Approximate Scale in Feet	Date: 7/24/14	Drawn by: AES	10:START-IV\13080020\fig 2

Attachment 1
Data Validation Memoranda

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MEMORANDUM

DATE: July 25, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington

SUBJ: **Field Laboratory Data Quality Assurance Review, Fourth Avenue and Gambell Parking Lot Removal Site, Anchorage, Alaska**

REF: TDD: 13-08-0020 PAN: EE-004534-0013-01TTO

The data quality assurance review of 41 field analytical ambient air samples collected from the Fourth Avenue and Gambell Parking Lot Removal site in Anchorage, Alaska, has been completed. Tetrachloroethene analyses (EPA Region 10 EMP Field Analytical SOP 309a/Modified EPA Method TO-15) were performed by Ecology and Environment, Inc., (E & E) Superfund Technical Assessment and Response Team (START) personnel at the site. All sample analyses were evaluated following EPA's Stage 2B Data Validation Manual Process (S2BVM). The sample locations were labeled:

736 3rd Avenue

HS01IA01	North Duplex - Laundry Room
HS01IA02	North Duplex - South Sample Point (in basement area)
HS01IA03	North Duplex - Central Sample Point (at raised slab)
HS01IA04	North Duplex - North Sample Point (on raised slab)
HS02BK01	South Duplex – Background
HS02CS01	South Duplex - Crawlspace South Sample Point
HS02CS02	South Duplex - Crawlspace North Sample Point
HS01IA07	North Duplex
HS01IA08	North Duplex
HS01IA09	North Duplex – Laundry Room
HS02CS03	South Duplex – South Section
HS02CS04	South Duplex – North Section
HS01IA10	North Duplex – Middle of Shop
HS01IA11	North Duplex – Middle of Shop
HS01IA12	North Duplex – Floor Drain
HS01IA13	North Duplex – Laundry Room

720 3rd Avenue

HS03CS01	Crawlspace
HS03BK01	Background
HS03IA01	Laundry Room
HS03IA02	Tool Room
HS03IA03	North Bed Room
HS03IA04	Art Room
HS03IA05	Hallway
HS03IA06	Laundry Room (Utility Cubby)
HS03CS02	Crawlspace
HS03BK02	Background

HS03IA07	Tool Room
HS03IA08	Bedroom
HS03IA09	Artwork Room
HS03IA10	Utility Room
HS03IA11	Stairwell
HS03IA12	Ground Floor Master Bedroom
HS03IA13	Stairwell

710 3rd Avenue

HS04IA01	Basement
HS04CS01	Crawlspace (in Basement)
HS04IA02	Former Office Area (in Basement)
HS04IA01	Storage Area (under stairs)
HS04BK02	Background
HS04IA04	North Bedroom
HS04IA05	Utility Room
HS04IA06	South Hallway

Data Qualifications:

1. **Sample Holding Times: Not Applicable.**

The ambient air samples were analyzed using the real time SIM mode; therefore holding times are not applicable.

2. **Tuning: Acceptable.**

Tuning was performed at the start of each analysis sequence and results were within QC limits.

3. **Initial Calibration: Satisfactory.**

All average Relative Response Factors (RRFs) were within the QC limits. The correlation coefficient was within QC limits of > 0.900. An initial calibration was not performed until after the May 12, 2014 analyses were completed; associated sample results from May 12, 2014 were qualified as estimated quantities with an unknown bias (JK or UJK).

4. **Continuing Calibration: Satisfactory.**

All % differences were within the QC limits of ± 30%. A calibration prior to analysis was not performed on May 28, 2014; associated sample results were qualified as estimated quantities (JK or UJK).

5. **Blanks: Satisfactory.**

A method blank was analyzed daily except for May 12, 2014; associated positive sample results were qualified as estimated quantities (JK). There were no detections in any method blank that affected sample results since all blank results were less than the reporting limit.

6. **Internal Standards: Not Applicable.**

Internal standards are not required for this method.

7. **Precision and Bias Determination: Not Performed.**

Samples necessary to determine precision and bias are not required and were not provided to the field laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

8. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples are not required and were not provided to the field laboratory.

9. Comparison of Hapsite Field Results with Other Sampling Methods Results: Not Performed.

Three START sample locations also had SUMMA canister samples collected by the EPA's ERRS contractor and were analyzed for tetrachloroethene. Due to the limited number of analyses, a statistical comparison does not provide meaningful results and was not performed. For comparison purposes only, a correlation coefficient was obtained for these three pairs of results and was determined to be 0.965, which indicates excellent correlation.

10. Overall Assessment of Data for Use

All retention times for positive sample results were within $\pm$ 0.06 relative retention time units of the continuing calibration retention times. All mass spectra fit ratios were greater than 0.7 for positive results. The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), and the analytical methods. Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Sample	Date	Location	Sub-Location	Parameter	Result	Unit	Result	Unit	Qualifier	SUMMA Result	SUMMA Unit
HS01IA01	5/12/2014	736 3rd Ave	North Duplex - Laundry Room	Tetrachloroethylene	11.74	ppb	79.63	ug/m^3	JK	n/a	n/a
HS01IA02	5/12/2014	736 3rd Ave	North Duplex - South Sample Point (in basement area)	Tetrachloroethylene	11.303	ppb	76.66	ug/m^3	JK	n/a	n/a
HS01IA03	5/12/2014	736 3rd Ave	North Duplex - Central Sample Point (at raised slab)	Tetrachloroethylene	7.566	ppb	51.32	ug/m^3	JK	n/a	n/a
HS01IA04	5/12/2014	736 3rd Ave	North Duplex - North Sample Point (on raised slab)	Tetrachloroethylene	0.004	ppb	0.03	ug/m^3	UJK	n/a	n/a
HS03CS01	5/13/2014	720 3rd Ave	Crawlspace	Tetrachloroethylene	0.004	ppb	0.03	ug/m^3	U	n/a	n/a
HS02BK01	5/13/2014	736 3rd Ave	South Duplex - Background	Tetrachloroethylene	0.004	ppb	0.03	ug/m^3	U	n/a	n/a
HS02CS01	5/13/2014	736 3rd Ave	South Duplex - Crawlspace South Sample Point	Tetrachloroethylene	2.517	ppb	17.07	ug/m^3		n/a	n/a
HS02CS02	5/13/2014	736 3rd Ave	South Duplex - Crawlspace North Sample Point	Tetrachloroethylene	2.44	ppb	16.55	ug/m^3		n/a	n/a
HS04IA01	5/14/2014	710 3rd Ave	Basement	Tetrachloroethylene	0.502	ppb	3.40	ug/m^3		n/a	n/a
HS04CS01	5/14/2014	710 3rd Ave	Crawlspace (in Basement)	Tetrachloroethylene	0.578	ppb	3.92	ug/m^3		n/a	n/a
HS04IA02	5/14/2014	710 3rd Ave	Former Office Area (in Basement)	Tetrachloroethylene	0.554	ppb	3.76	ug/m^3		n/a	n/a
HS04IA03	5/14/2014	710 3rd Ave	Storage Area (under stairs)	Tetrachloroethylene	0.503	ppb	3.41	ug/m^3		n/a	n/a
HS03BK01	5/14/2014	720 3rd Ave	Background	Tetrachloroethylene	0.004	ppb	0.03	ug/m^3	U	n/a	n/a
HS03IA01	5/14/2014	720 3rd Ave	Laundry Room	Tetrachloroethylene	20.774	ppb	140.90	ug/m^3		n/a	n/a
HS03IA02	5/14/2014	720 3rd Ave	Tool Room	Tetrachloroethylene	18.108	ppb	122.82	ug/m^3		n/a	n/a
HS03IA03	5/14/2014	720 3rd Ave	North Bed Room	Tetrachloroethylene	18.348	ppb	124.45	ug/m^3		n/a	n/a
HS03IA04	5/14/2014	720 3rd Ave	Art Room	Tetrachloroethylene	17.963	ppb	121.84	ug/m^3		n/a	n/a
HS03IA05	5/14/2014	720 3rd Ave	Hallway	Tetrachloroethylene	20.543	ppb	139.33	ug/m^3		n/a	n/a
HS03IA06	5/14/2014	720 3rd Ave	Laundry Room (Utility Cubby)	Tetrachloroethylene	16.881	ppb	114.50	ug/m^3		n/a	n/a
HS03CS02	5/14/2014	720 3rd Ave	Crawlspace	Tetrachloroethylene	0.004	ppb	0.03	ug/m^3	U	n/a	n/a
HS04BK02	5/28/2014	710 3rd	Background	Tetrachloroethylene	0.5	ppb	3.39	ug/m^3	JK	n/a	n/a
HS04IA04	5/28/2014	710 3rd	North Bedroom	Tetrachloroethylene	0.583	ppb	3.95	ug/m^3	JK	n/a	n/a
HS04IA05	5/28/2014	710 3rd	Utility Room	Tetrachloroethylene	0.486	ppb	3.30	ug/m^3	JK	n/a	n/a
HS04IA06	5/28/2014	710 3rd	South Hallway*	Tetrachloroethylene	0.749	ppb	5.08	ug/m^3	JK	3.9	ug/m^3
HS03BK02	5/28/2014	720 3rd	Background	Tetrachloroethylene	0.004	ppb	0.03	ug/m^3	UJK	n/a	n/a
HS03IA07	5/28/2014	720 3rd	Tool Room	Tetrachloroethylene	16.405	ppb	111.27	ug/m^3	JK	n/a	n/a
HS03IA08	5/28/2014	720 3rd	Bedroom*	Tetrachloroethylene	15.107	ppb	102.46	ug/m^3	JK	66	ug/m^3
HS03IA09	5/28/2014	720 3rd	Artwork Room	Tetrachloroethylene	17.939	ppb	121.67	ug/m^3	JK	n/a	n/a
HS03IA10	5/28/2014	720 3rd	Utility Room	Tetrachloroethylene	16.185	ppb	109.78	ug/m^3	JK	n/a	n/a
HS03IA11	5/28/2014	720 3rd	Stairwell	Tetrachloroethylene	9.627	ppb	65.30	ug/m^3	JK	n/a	n/a
HS03IA12	5/28/2014	720 3rd	Ground Floor Master Bedroom	Tetrachloroethylene	3.999	ppb	27.12	ug/m^3	JK	n/a	n/a
HS03IA13	5/28/2014	720 3rd	Stairwell	Tetrachloroethylene	8.162	ppb	55.36	ug/m^3	JK	n/a	n/a
HS01IA05	5/29/2014	736 3rd	North - Basement (Center)*	Tetrachloroethylene	24.974	ppb	169.39	ug/m^3		78	ug/m^3
HS01IA06	5/29/2014	736 3rd	North - Basement (North)	Tetrachloroethylene	31.031	ppb	210.47	ug/m^3		n/a	n/a
HS01IA07	5/29/2014	736 3rd	North - Laundry Room	Tetrachloroethylene	16.373	ppb	111.05	ug/m^3		n/a	n/a
HS02CS03	5/29/2014	736 3rd	South - South Section	Tetrachloroethylene	3.257	ppb	22.09	ug/m^3		n/a	n/a
HS02CS04	5/29/2014	736 3rd	South - North Section	Tetrachloroethylene	2.847	ppb	19.31	ug/m^3		n/a	n/a
HS01IA08	6/13/2014	736 3rd	North Duplex - Middle of Shop (previous Summa Point)	Tetrachloroethylene	22.078	ppb	149.75	ug/m^3		n/a	n/a
HS01IA09	6/13/2014	736 3rd	North Duplex - Middle of Shop (previous Summa Point)	Tetrachloroethylene	22.451	ppb	152.28	ug/m^3		n/a	n/a
HS01IA10	6/13/2014	736 3rd	North Duplex - Floor Drain	Tetrachloroethylene	21.569	ppb	146.29	ug/m^3		n/a	n/a
HS01IA11	6/13/2014	736 3rd	North Duplex - Laundry Room	Tetrachloroethylene	18.988	ppb	128.79	ug/m^3		n/a	n/a

* - These samples were collocated with ERRS SUMMA canisters.

Key

ug/m^3 - micrograms per cubic meter

n/a - not applicable

ppb - parts per billion

7-25-14

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MEMORANDUM

DATE: July 22, 2014

TO: Steve Hall, Project Manager, E & E, Seattle, Washington

FROM: Mark Woodke, START-4 Chemist, E & E, Seattle, Washington MW

SUBJ: **Organic Data Quality Assurance Review, Fourth Avenue and Gambell Parking Lot Removal Site, Anchorage, Alaska**

REF: TDD: 13-08-0020 PAN: EE-004534-0013-01TTO

The data quality assurance review of 5 ambient air samples collected from the Fourth Avenue and Gambell Parking Lot Removal site in Anchorage, Alaska, has been completed. Selected volatile organic compound (VOC) analyses (EPA Method TO-15) were performed by ALS Environmental, Inc., Simi Valley, California. The samples were collected by the EPA's ERRS contractor. A full data package was not provided for data review; this review only covers the provided information. All sample analyses were evaluated following EPA's Stage 2 Data Validation Manual Process (S2VM). The sample locations were labeled:

14-4G-113-IA 14-4G-111-IA 14-4G-110-IA 14-4G-108-IA 14-4G-106-IA

Data Qualifications:

1. **Sample Holding Times: Acceptable.**

The samples were collected on May 28, 2014, and were analyzed on June 3, 2014, therefore meeting QC criteria of less than 30 days between collection and analysis for SUMMA canister samples.

2. **Tuning: Not Provided.**

3. **Initial Calibration: Not Provided.**

4. **Continuing Calibration: Not Provided.**

5. **Blanks: Acceptable.**

A method blank was analyzed for each 20 sample batch per matrix. There were no detections in any method blank.

6. **System Monitoring Compounds (SMCs): Acceptable.**

All SMC recoveries were within QC limits.

7. **Blank Spike (BS) Analysis: Acceptable.**

BS analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All recoveries were within QC limits.

8. Duplicate Analysis: Acceptable.

Laboratory duplicate analysis was performed per SDG or per matrix per concentration level, whichever was more frequent. All duplicate results were within QC limits.

9. Internal Standards: Not Provided.

10. Precision and Bias Determination: Not Performed.

Samples necessary to determine precision and bias were not provided to the laboratory. All results were flagged "PND" (Precision Not Determined) and "RND" (Recovery Not Determined), although the flags do not appear on the data sheets.

11. Performance Evaluation Sample Analysis: Not Provided.

Performance evaluation samples were not provided to the laboratory.

12. Overall Assessment of Data for Use

The reviewer used professional judgment to apply a single bias qualifier when more than one bias qualifier was applicable to an individual estimated sample result.

The overall usefulness of the data is based on the criteria outlined in the Site-Specific Sampling Plan and/or Sampling and Quality Assurance Plan, the OSWER Guidance Document "Quality Assurance/Quality Control Guidance for Removal Activities, Sampling QA/QC Plan, and Data Validation Procedures" (EPA/540/G-90/004), the analytical method, and, when applicable, the Office of Emergency and Remedial Response Publication "USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review". Based upon the information provided, the data are acceptable for use with the above stated data qualifications.

Data Qualifiers and Definitions

U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

JH - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a high bias.

JL - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with a low bias.

JK - The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias.

JQ – The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample with an unknown direction of bias and falls between the MDL and the Minimum (or Practical) Quantitation Limit (MQL, PQL).

N - The analysis indicates the present of an analyte for which there is presumptive evidence to make a "tentative identification".

NJ - The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.

UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.

R - The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **14-4G-113-IA**
Client Project ID: **4th and Gambell / 20282.02**

ALS Project ID: P1402171
ALS Sample ID: P1402171-005

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: John Rice
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: AC01763

Date Collected: 5/28/14
Date Received: 5/30/14
Date Analyzed: 6/3/14
Volume(s) Analyzed: 1.00 Liter(s)

Initial Pressure (psig): -3.77 Final Pressure (psig): 3.72

Canister Dilution Factor: 1.69

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.17	ND	0.066	
75-35-4	1,1-Dichloroethene	ND	0.17	ND	0.043	
156-60-5	trans-1,2-Dichloroethene	ND	0.17	ND	0.043	
156-59-2	cis-1,2-Dichloroethene	ND	0.17	ND	0.043	
79-01-6	Trichloroethene	ND	0.17	ND	0.031	
127-18-4	Tetrachloroethene	**8.8**	0.17	**1.3**	0.025	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

MW 7-22-14

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **14-4G-111-IA**
Client Project ID: **4th and Gambell / 20282.02**

ALS Project ID: P1402171
ALS Sample ID: P1402171-004

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: John Rice
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: AS00145

Date Collected: 5/28/14
Date Received: 5/30/14
Date Analyzed: 6/3/14
Volume(s) Analyzed: 1.00 Liter(s)

Initial Pressure (psig): 0.65 Final Pressure (psig): 3.69

Canister Dilution Factor: 1.20

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.12 U	ND	0.047 U	
75-35-4	1,1-Dichloroethene	ND	0.12 U	ND	0.030 U	
156-60-5	trans-1,2-Dichloroethene	**0.82**	0.12	**0.21**	0.030	
156-59-2	cis-1,2-Dichloroethene	ND	0.12 U	ND	0.030 U	
79-01-6	Trichloroethene	ND	0.12 U	ND	0.022 U	
127-18-4	Tetrachloroethene	**53**	0.12	**7.8**	0.018	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

JMW 7-22-14

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **14-4G-110-IA**
Client Project ID: **4th and Gambell / 20282.02**

ALS Project ID: P1402171
ALS Sample ID: P1402171-003

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: John Rice
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: AC01839

Date Collected: 5/28/14
Date Received: 5/30/14
Date Analyzed: 6/3/14
Volume(s) Analyzed: 1.00 Liter(s)

Initial Pressure (psig): -2.96 Final Pressure (psig): 3.61

Canister Dilution Factor: 1.56

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.16 U	ND	0.061 U	
75-35-4	1,1-Dichloroethene	ND MW	0.16 U	ND MW	0.039 U	
156-60-5	trans-1,2-Dichloroethene	**0.84**	0.16	**0.21**	0.039	
156-59-2	cis-1,2-Dichloroethene	ND	0.16 U	ND	0.039 U	
79-01-6	Trichloroethene	ND MW	0.16 U	ND MW	0.029 U	
127-18-4	Tetrachloroethene	**78**	0.16	**11**	0.023	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

MW 7-22-14

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **14-4G-108-IA**
Client Project ID: **4th and Gambell / 20282.02**

ALS Project ID: P1402171
ALS Sample ID: P1402171-002

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: John Rice
Sample Type: 6.0 L Summa Canister
Test Notes:
Container ID: AC01526

Date Collected: 5/28/14
Date Received: 5/30/14
Date Analyzed: 6/3/14
Volume(s) Analyzed: 1.00 Liter(s)

Initial Pressure (psig): -3.27 Final Pressure (psig): 3.70

Canister Dilution Factor: 1.61

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.16	ND	0.063	
75-35-4	1,1-Dichloroethene	ND	0.16	ND	0.041	
156-60-5	trans-1,2-Dichloroethene	ND	0.16	ND	0.041	
156-59-2	cis-1,2-Dichloroethene	ND	0.16	ND	0.041	
79-01-6	Trichloroethene	ND	0.16	ND	0.030	
127-18-4	Tetrachloroethene	**3.9**	0.16	**0.57**	0.024	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

MW 7-22-14

ALS ENVIRONMENTAL

RESULTS OF ANALYSIS

Client: **GeoSyntec Consultants**
Client Sample ID: **14-4G-106-IA**
Client Project ID: **4th and Gambell / 20282.02**

ALS Project ID: P1402171
ALS Sample ID: P1402171-001

Test Code: EPA TO-15
Instrument ID: Tekmar AUTOCAN/Agilent 5975Cinert/6890N/MS16
Analyst: John Rice
Sample Type: 6.0 L Silonite Canister
Test Notes:
Container ID: AS00107

Date Collected: 5/28/14
Date Received: 5/30/14
Date Analyzed: 6/3/14
Volume(s) Analyzed: 1.00 Liter(s)

Initial Pressure (psig): -2.80 Final Pressure (psig): 3.62

Canister Dilution Factor: 1.54

CAS #	Compound	Result µg/m³	MRL µg/m³	Result ppbV	MRL ppbV	Data Qualifier
75-01-4	Vinyl Chloride	ND	0.15 U	ND	0.060 U	
75-35-4	1,1-Dichloroethene	ND	0.15 U	ND	0.039 U	
156-60-5	trans-1,2-Dichloroethene	**0.19**	0.15	**0.049**	0.039	
156-59-2	cis-1,2-Dichloroethene	ND	0.15 U	ND	0.039 U	
79-01-6	Trichloroethene	ND	0.15 U	ND	0.029 U	
127-18-4	Tetrachloroethene	**66**	0.15	**9.7**	0.023	

ND = Compound was analyzed for, but not detected above the laboratory reporting limit.
MRL = Method Reporting Limit - The minimum quantity of a target analyte that can be confidently determined by the referenced method.

MW 7-22-14